DOCUMENT RESUME

ED 287 555 PS 016 586

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TITLE Control of Level of Challenge: Effects on Intrinsic Motivation to Play.
PUB DATE 23 Apr 87
NOTE 13p.; Paper presented at the Biennial Meeting of the Society for Research in Child Development (Baltimore, MD, April 23-26, 1987).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS *Difficulty Level; *Motivation; Performance Factors; *Persistence; *Play; *Preschool Children; Preschool Education; *Selection; Success
IDENTIFIERS *Intrinsic Motivation

ABSTRACT

To investigate the effects of task difficulty level and control over the level of difficulty on children's intrinsic motivation to play, attempts and successes were recorded as 80 four-year-old children played a bean bag game. The object of the game was to hit a target from one of five distances. Each of the distances constituted a different level of difficulty. All subjects participated in both a choice condition, in which they selected target distance and were free to move at any time, and an assigned condition, in which they tossed the bag from short or long distances. Subjects were randomly assigned to easy and hard groups and to sessions in which the choice condition was either first or last. Findings indicated that in the choice condition, no main or interaction effects due to group or session were found on attempts, successes, or success-attempt ratio. In the assigned condition, more attempts and successes were made by children in the easy group than by those in the hard group. Children in the hard group made more attempts in the choice condition than did those in the assigned condition. For the easy group, no significant difference between choice and assigned conditions was found in attempts or successes. Greater persistence in the easy condition was interpreted as evidence of the facilitating effect of success. Children in the choice condition did not choose the easiest level. They had a lower success ratio, but persisted as well as children in the easy condition. (Author/RH)

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Control of Level of Challenge: Effects on Intrinsic Motivation to Play

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Paper presented at the Society for Research in Child Development, Baltimore, Maryland, April 23, 1987.

PS 016586

Abstract

The role of the level of challenges and control vs. no control of the level of challenges in a task were studied in terms of effects on motivation to persist in play. Attempts and successes were recorded as 80 4-year-olds played a bean bag game in which the object was to hit a target from one of 5 levels of difficulty (distances from the target). All subjects participated in both a choice condition, in which they selected target distance and were free to move at any time, and in an assigned condition in which they tossed the bag from either level 0 (easy) or 5 (hard). Subjects were randomly assigned to group (easy/hard) and session (choice first or last).

In the choice condition, there were no main or interaction effects on attempts, successes, or success/attempt ratio due to group or session. In the assigned condition more attempts and successes were made by the easy than the hard group. Children in the hard group made more attempts in the choice than in the assigned condition. For the easy group there was no significant difference in attempts or successes in the choice vs. assigned conditions. Greater persistence in the easy condition was interpreted as evidence of the facilitating effect of success. Children in the choice condition did not choose the easiest level, had a lower success ratio, but persisted equally.

CONTROL OF LEVEL OF CHALLENGE: EFFECTS ON INTRINSIC MOTIVATION TO PLAY

Play has typically been valued for its role in adaptation (Bruner, 1972; Rubin, Fein, & Vandenberg, 1983). Outcomes such as improved problem solving (e.g., Dansky & Silverman, 1973; Pepler, 1979; Sylva, 1977; Vandenberg, 1980), creativity (e.g., Lieberman, 1965; Singer & Rummo, 1973; Wallach & Kogan, 1965), and adjustment (Erikson, 1950/1963) are often cited as justifications for play in programs for children. If play is valued as a dispositional state worthy of pursuit for its inherent qualities (Rogers & Sawyers, in press), then research on conditions that enhance or deter play as a dependent variable (Vandenberg, 1985) are in order. Recent studies on the influences of familial (Frodi, Bridges, & Grolnick, 1985; Moore, 1985) and other ecological influences (Rubin et al., 1983) indicate some interest in this area. This study focused on control of level of challenge as a contextual effect on intrinsic motivation to play.

Intrinsic motivation, non-literality, active involvement, attention to means, freedom from externally-imposed rules, and positive affect are definitional components of play (Rubin et al., 1983; Smith & Vollstedt, 1985). Similar terms were used by Csikszentmihayli (1975) to describe flow.

Intrinsic motivation to play may be the result of singular or interactive influences of three aspects of motivation (Gottfried, 1985). These include (a) the motivation to reduce arousal induced by cognitive discrepancy, (b) competency motivation, and (c) children's ideas about the causes of their behavior. The competence theories of intrinsic motivation suggest that children play in order to deal

effectively with their environment (White, 1959) through the mastery of skills (Bruner, 1972, 1973; Piaget, 1951/1962) or the mastery of traumatic events (Erikson, 1950/1963, 1977; Freud, 1961). Indeed, empirical research has shown that infants enjoy having toys or other stimuli that respond contingently to their actions (e.g., Jennings, Harmon, Morgan, Gaiter, & Yarrow, 1979; Siqueland & Delucia, 1969; Watson & Ramey, 1972) thus allowing them control over the outcome of their actions. Research on the attribution aspect of intrinsic motivation, i.e., children's ideas about the causes of their behavior, indicates that rewards imply external control which undermines intrinsic motivation (e.g., Leeper, Green, & Nisbett, 1973). However, rewards may facilitate intrinsic motivation if they are used in such a way as to enhance the child's perception of competence or self-determination in choosing an activity (Deci & Ryan, 1980; Leeper, 1983; Pittman, Boggiano, & Ruble, 1983).

Csikszentmihayli's (1975) concept of flow incorporates, to some degree, each of the three views of intrinsic motivation. Influenced by Berlyne's (1966) cognitive discrepancy theory, by White's (1959) theory of competence motivation, and an awareness of the importance of a sense of control, Csikszentmihayli (1975) proposed a skill-challenge discrepancy model called flow. Flow refers to an enjoyable state experienced when intrinsically motivated persons are activity engrossed in self-selected, goal-directed activities over which they have control and for which there is immediate feedback. Csikszentmihayli's (1975, 1979) research indicates that the state of flow is most likely to occur when skills and challenges are equally matched. When the level of skill required for an activity is higher than the individual has available,

the experience may be worry or anxiety. If an individual perceives the available skills as greater than the challenge, the resulting state may be boredom. Csikszentmihayli's (1975) model was derived from his studies of play among adults, including rock climbers, chess players, dancers, surgeons, and basketball players

The elements of control and challenge set flow in perspective with play. In play, the child is in control and is free to move along the flow diagonal. Since the child may make goal alterations at any point (Rubin et al., 1983), it is possible to increase or decrease challenges to achieve equilibrium with the level of skills available. According to Csikszentmihayli (1979), play is a type of flow in which the player has control over the challenges; however, flow may also occur in non-play situations that involve external pressures to increase skills, so long as there is a minimal discrepancy between the level of difficulty of the task.

Based on Csikszentmihayli's (1975) model, we hypothesized that intrinsic motivation to play, as measured by persistence in a task offering the opportunity for mastery and feedback, would be influenced by whether or not the child had choice over the level of difficulty of the task. We predicted that children in a choice condition would demonstrate greater persistence than those in no-choice conditions. Further, we predicted that, when given no control over the level of challenge, persistence would be greater in a condition which maximizes success, i.e., easy rather than hard.

More specifically, this study was conducted to compare the differences in the number of attempts children made at a task under three conditions: (a) the children were given the opportunity to match

the challenge to their skill level; (b) a challenge was assigned at a level likely to be greater than the child's skill level; or (c) a challenge was assigned at a level at which the skills were likely to be greater than the challenge. In all conditions subjects had choice over whether to participate and about how long they would continue to play.

Method

Subjects

The sample consisted of 80 children who were enrolled at a university laboratory school (n=18) or at one of three other child care centers in the same town (ns=38, 13, and 11). The sample included 40 males and 40 females, and sex was approximately equally balanced within centers. A restricted age range (4-0 to 4-11) was studied so as to minimize developmental variability in competence to perform the task.

Procedure

A bean bag game was set up in a vacant room at each school. A board, 121.9 cm x 68.6 cm, with a hole, 17.8 cm in diameter, and 71.1 cm from the floor was the target. A wide grid on the floor marked the distance from the target. The grid was marked 0 through 5 to 45.8 cm intervals from the board. These distances were selected based on norms for target-throwing reported by Arnheim and Sinclair (1975). Starkweather used a similar task in a study on children's willingness to try difficult tasks. Willingness to try was measured by number of times the child attempted a task. She found this task to have face validity and reliability (r=.8). In the present study, the number of attempts a child made at throwing the bean bag was assumed to reflect intrinsic motivation to continue the activity. The game was conducted

at each school during indoor or outdoor play time. Each child was invited by the experimenter to play a game but no child was forced to participate.

All subjects participated in both a choice and an assigned (no-choice) condition, with the order of conditions counterbalanced. In the choice condition, subjects were given autonomy to choose the levels at which they played, whereas, in the assigned condition, subjects were assigned one of two levels of challenge (easy or hard). When each child entered the room, the experimenter explained,

> This is a bean bag game. I will tell you about the game and then, if you'd like, you may play it. To play the game, throw the bean bag through the hole in this board. Throw the bean bag as many times as you'd like, but each time you will need to pick it up. When you are ready to stop playing, please bring the bean bag to me so that I will know you have finished.

The child when received further instructions depending on the assigned condition. In the choice condition, all children were informed that they could stand at any level they chose on the grid and they were also free to move about to other levels during the play period. In the assigned-hard condition, children were instructed to stand only at marker 5, which was 304.8 cm from the target. In the assigned-easy condition, children were instructed to stand only at marker 0, which was 78.7 cm from the target. For all conditions, the experimenter then said, "I cannot talk to you while you are playing because I have some things I need to write." To ensure that children did not continue with the task because of adult reinforcement, the experimenter then took a

seat behind a screen located behind the subject and did not reestablish facial or verbal contact until the subject indicated readiness to cease the task. If a child asked a question, the experimenter restated the directions with a neutral expression and without eye contact.

The experimenter recorded the number of attempts, successes, total time, and the grid number (level of challenge) from which the bag was tossed. Two undergraduate and one graduate student served as experimenters. Pilot testing and training reflected 100% inter-rater reliability due to the simplicity of the definition of a throw (arm raised, bean bag propelled with force but not dropped) and a success (bag passes through the hole or lands on edge of hole and balances).

Results

Means and standard deviations for the number of attempts, the number of successes, and the success/attempt ratio are shown in Table 1 for CHOICE conditions and in Table 2 for ASSIGNED conditions. Results are broken down by the order in which the conditions were experienced.

ANOVA's were used to test for the effects of order (choice first, choice last) and group (choice/easy, choice/hard) on the number of attempts, the number of successes, and the success/attempt ratio. Paired T's were used to make within-subjects comparisons across conditions.

Attempts. For the number of attempts in the assigned condition (assigned-hard or assigned-easy), a 2 x 2 (order by group) ANOVA indicated a significant main effect due to group, $F(3,76) = 4.62$, $p < .05$, and a significant order by group interaction ($p < .10$), with those in the choice-hard group who received choice first showing fewer attempts when later assigned to the hard condition. The significant

group effect was due to a higher number of attempts by the assigned-easy than by the assigned-hard group. There were no significant group or order effects on number of attempts in the choice condition. Within the assigned-hard group (n=45), the number of attempts in the choice condition, $T(44)=4.84$, $p < .05$. Within the assigned-easy group, there was no significant difference between the number of attempts in the choice and the assigned-easy conditions, $T(34)=.58$, ns.

Successes. For the number of successes in the assigned condition, a 2 x 2 (order by group) ANOVA indicated a significant effect due to group, $F(3, 76)=61.98$, $p < .001$, with subjects in the assigned-easy condition having more successes than those in the assigned-hard condition. There was no significant order by group interaction due to the number of successes in the assigned conditions. There were no significant main effects due to group or session (and no significant interactions) on the number of successes in the choice condition. Within the assigned-hard group, children had significantly more successes in the choice than in the assigned-hard condition, $T(44)=6.24$, $p < .005$. Within the assigned-easy group, children had significantly more successes in the assigned-easy than in the choice condition, $T(34)=2.06$, $p < .05$.

Success/Attempt Ratio. A 2 x 2 (order by group) ANOVA indicated no significant main or interaction effects on the success/attempt ratio when in the choice condition. However, in the assigned conditions, the assigned-easy group had a significantly higher ratio of success than did the assigned-hard group, $F(3, 76)=236.32$, $p < .001$. Within the assigned hard group, the mean success/attempt ratio was significantly higher in the choice than in the hard condition, $T(44)=10.36$, $p < .005$.

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Within the assigned-easy group, the mean success/attempt ratio was greater in the easy than in the choice condition, $T(34)=3.45$, $p < .005$.

Conclusions

When control over level of difficulty was not available to children in this study, persistence (measured by the number of task attempts) was greater in the group that experienced a higher rate of success (easy rather than hard). When control was available (choice condition), persistence was greater than when there was no control and children were assigned to the hard condition. However, persistence scores were not significantly different between the choice condition and the easy condition. The failure to find significant differences between choice and easy conditions was attributed partially to the fact that even in the easy condition in which children stood near the target, the task was still challenging. Therefore, the level designated as easy was actually the highest level at which many children could succeed. As such the easy level was an approximate match to the level of ability of many children in the study.

Although persistence scores were not significantly different between the easy and choice conditions, children in the choice condition condition made several attempts beyond the easy level. In the choice condition the success/attempt ratio was lower than in the easy condition. Children were tolerating self-imposed failure in order to attempt a higher level of challenge. This risk-taking behavior seems to be an attempt to challenge themselves at the highest level at which they could experience success,

In summary, control of the level of difficulty of challenge in a bean-bag toss game leads to increased peristence only if the control

increases success. Success contributes to persistence independent of choice as evidenced in the differential persistence rates in the assigned conditions. Choice, accompanied by increased risk-taking or attempts at high levels of challenge is accompanied by a higher tolerance of failure as evidenced by continued persistence despite a lower success/attempt ratio. Self-regulation of levels of challenge provides the opportunity to develop skills beyond the individual's present capacity.

Table 1

Means and Standard Deviations for Attempts, Successes, and Percent Success: Choice Condition

Group	N	Choice Condition					
		Attempts		Successes		~~Percent~~ Success Rate	
		M	SD	M	SD	M	SD
Choice/Easy							
Choice First	16	22.38	26.55	7.25	9.24	.384	0.32
Choice Last	19	16.84	9.72	6.05	6.08	.420	0.28
Choice/Hard							
Choice First	24	22.04	22.71	7.80	9.57	0.374	0.24
Choice Last	21	26.10	20.92	7.52	6.21	0.30	0.16

Table 2

Means and Standard Deviations for Attempts, Successes, and Percent Success: Assigned Condition

Group	N	Assigned Condition					
		Attempts		Successes		~~Percent~~ Success Ratio	
		M	SD	M	SD	M	SD
Choice/Easy							
Choice First	16	20.06	18.82	9.45	8.94	.496	0.24
Choice Last	19	16.47	12.16	8.05	5.48	.542	0.20
Choice/Hard							
Choice First	24	9.04	7.94	0.21	0.83	0.012	0.041
Choice Last	21	14.95	11.95	0.14	0.36	0.011	0.025